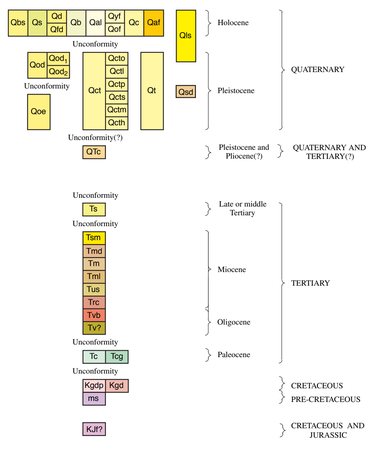
CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qaf **Artificial fill (Holocene)**—Heterogeneous mixture of artificially deposited material ranging from well-compacted sand and silt to poorly compacted sediment high in organic content; only locally delineated

Qbs **Beach sand deposits (Holocene)**—Unconsolidated, well-sorted, medium- to coarse-grained sand; local layers of pebbles and cobbles

Qs **Marine sand deposits (Holocene)**—Unconsolidated, gray to buff, fine- to coarse-grained sand on sea floor

Qd **Dune sand deposits (Holocene)**—Unconsolidated, well-sorted, fine-to medium-grained sand; deposited as linear strip of coastal dunes

Qb **Basin deposits (Holocene)**—Unconsolidated, plastic clay and silty clay containing much organic material; locally contains interbedded thin layers of silt and silty sand

Qal **Alluvial deposits, undivided (Holocene)**—Unconsolidated, heterogeneous, moderately sorted silt and sand with discontinuous lenses of clay and silty clay

Qyf **Younger flood-plain deposits (Holocene)**—Unconsolidated, relatively fine-grained, heterogeneous deposits of sand and silt; commonly includes relatively thin, discontinuous layers of clay. Near mouth of Carmel River, these occur as a veneer of levee deposits over older flood-plain deposits, indicated by a subscript (a) following symbol.

Qof **Older flood-plain deposits (Holocene)**—Unconsolidated, relatively fine-grained, heterogeneous deposits of sand and silt, commonly includes relatively thin layers of clay

Qc **Colluvium (Holocene)**—Unconsolidated, heterogeneous deposits of moderately to poorly sorted silt, sand, and gravel deposited by slope wash and mass movement

Qfd **Flandrian dune deposits of Cooper (1967) (Holocene)**—Unconsolidated, well-sorted sand deposited in a belt of parabolic dunes

Qls **Landslide deposits (Quaternary)**—Heterogeneous mixture of deposits ranging from large block slides in indurated bedrock to debris flows in semiconsolidated sand and clay

Qod **Older coastal dunes (Pleistocene)**—Weakly consolidated, well-sorted, fine-to medium-grained sand. Some geologic deposits are covered with a thin veneer of eolian deposits. In some areas, this is indicated by a subscript (e) following the symbol for the geologic unit overlain by the eolian deposits. Locally divided into:

Qod_1 **Younger dune deposits (Pleistocene)**—Weakly consolidated, well-sorted, fine- to medium-grained sand deposited in an extensive coastal dune field. Age of unit is middle(?) Wisconsinan

Qod_2 **Older dune deposits (Pleistocene)**—Weakly to moderately consolidated, moderately well-sorted silt and sand deposited in extensive coastal dune fields. Age of unit is early(?) Wisconsinan

Qct **Coastal terrace deposits, undivided (Pleistocene)**—Semiconsolidated, moderately well-sorted marine sand containing thin, discontinuous gravel-rich layers. Locally divided into:

Qcto **Ocean View coastal terrace (Pleistocene)**

Qctl **Lighthouse coastal terrace (Pleistocene)**

Qctp **Peninsula College coastal terrace (Pleistocene)**

Qcts **Sylvan coastal terrace (Pleistocene)**

Qctm **Monte Vista coastal terrace (Pleistocene)**

Qcth **Huckleberry coastal terrace (Pleistocene)**

Qt **Terrace deposits, undivided (Pleistocene)**—Weakly consolidated to semiconsolidated, moderately to poorly sorted silt, silty clay, sand, and gravel mostly deposited in a fluvial environment

Qoe **Older eolian deposits (Pleistocene)**—Moderately well-sorted sand as much as 60 m thick that contains no intervening fluvial deposits

Qsd **Sedimentary deposits (Quaternary)**—Seismic characteristics suggest poorly bedded sand and gravel; stratigraphic position unknown. Unit crops out on sea floor

QTc **Continental deposits, undivided (Pleistocene-Pliocene?)**—Semiconsolidated, relatively fine-grained, oxidized sand and silt; includes some deposits of marine origin (locally mapped as QTm)

Ts **Sedimentary rocks (Tertiary)**—Marine; mudstone and coarse-grained, arkosic sandstone. Unit crops out on sea floor

Tsm **Santa Margarita Sandstone (Miocene)**—Marine and brackish-marine, white, friable, fine- to coarse-grained, arkosic sandstone. Age of unit is late Miocene

Tmd **Monterey Formation, diatomite (Miocene)**—Very pale orange to white, soft, punky, commonly silty; Mohnian Stage

Tm **Monterey Formation, porcelanite (Miocene)—**Light-brown to white, hard, brittle, platy; Mohnian Stage

Tml **Monterey Formation, semi-siliceous mudstone (Miocene)**—Thin-bedded, yellowish-brown, foraminiferal; includes interbedded siltstone; Luisian Stage

Tus **Unnamed sandstone (Miocene)**—Marine; buff to light-gray, poorly to well-sorted arkosic sandstone, locally friable, locally conglomeratic. Age of unit is middle Miocene

Trc **Red Beds Of Robinson Canyon (Miocene)**—Terrestrial; red to gray, poorly sorted arkosic sandstone, cobble conglomerate, and siltstone. Age of unit is probably middle Miocene

Tvb **Volcanic rocks (Oligocene)—**Flows and flow-breccias of basaltic andesite

Tv? **Vaqueros(?) Sandstone (Oligocene)**—Marine; yellowish-gray, thick-bedded arkosic sandstone

Tc **Carmelo Formation of Bowen (1965) (Paleocene)**—Marine; thin- to thick-bedded and graded arkosic sandstone with interbedded siltstone and pebble and cobble conglomerate. Locally divided into:

Tcg **Cobble and boulder conglomerate (Paleocene)**—Consists mostly of porphyritic granodiorite clasts

Kgdp **Porphyritic granodiorite of Monterey of Ross (1976) (Cretaceous)**

Kgd **Granodiorite of Cachagua of Ross (1976) (Cretaceous)**

ms **Schist of the Sierra de Salinas of Ross (1976) (pre-Cretaceous)**—Quartzofeldspathic schist

Kuf? **Franciscan Complex, undifferentiated**—Unit crops out on sea floor

Contact—Dashed where approximately located or gradational, dotted where concealed, queried where questionably located

Fault—Dashed where inferred, dotted where concealed, queried where doubtful. U, relatively upthrown side; D, relatively downthrown side. Half arrows indicate relative horizontal movement

Thrust fault—Dashed where inferred, dotted where concealed. Sawteeth on upper plate

Fold axis—Dashed where approximately located, dotted where concealed. Arrow on axial trace indicates direction of plunge

Anticline

Syncline

Inner edge of terrace deposit—May be shoreline angle of coastal terrace deposit or valley margin of fluvial terrace deposit; barbs on terrace side of scarp

Strike and dip of beds

Horizontal

Inclined—Broken where approximate

Direction of dip from distant view

Vertical

Overturned

Landslide deposit—Half arrows show general direction of movement

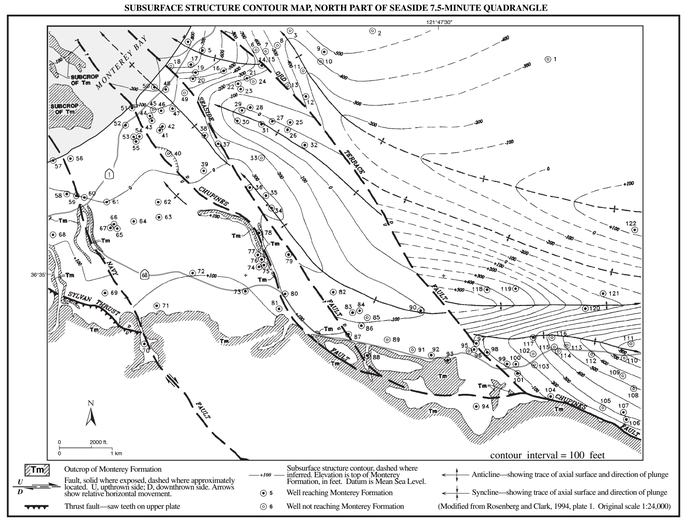
Spring

Quaternary deformation locality

QUATERNARY DEFORMATION LOCALITIES SHOWN ON SHEET 1

1. Marine terrace offset approximately 2 m along near-vertical, 3-m-wide shear zone separating porphyritic granodiorite from Carmelo Formation
2. Edge of marine terrace coincides with 8-m-wide sheared fault zone (strike approximately N. 25° W., dip 55° NE.), Cypress Point fault zone; no obvious offset of terrace deposits
3. Edge of fluvial terrace coincides with near-vertical fault zone trending N. 15°–20° W. in the Monterey Formation
4. Marine terrace deposits down-dropped along 32-m-wide near-vertical fault zone that strikes N. 10° W. (extension of fault at locality 3); sheared and contorted Monterey Formation is incorporated in terrace deposits
5. Possible faulted terrace gravel
6. Monterey Formation, terrace deposits, and colluvium thrust faulted in Sylvan thrust zone. Colluvium offset at least 1 m (^{14}C age of colluvium: 4,890±90 years B.P.); fault zone strikes N. 65° E., dips 38° SE.
7. Marine terrace deposits offset by Sylvan thrust fault with estimated throw of 10–15 m
8. Folded marine terrace deposits or possible soft-sediment deformation near mapped extension of Sylvan thrust fault
9. Marine terrace deposits strike approximately north, dip steeply along western extension of Sylvan thrust fault
10. Possible fault in marine(?) terrace deposits; sheared zone within deposits strikes N. 45° W., dips 60° NE.
11. Gently folded fluvial terrace deposits above mapped trace of Hatton Canyon fault zone cut by near-vertical clay-filled fractures that strike approximately N. 60° E.
12. Fluvial terrace deposits faulted against vertically dipping Monterey Formation. As much as 1 m vertical offset of landslide deposits and colluvium (^{14}C age of colluvium: 2,080±40 years B.P.); fault strikes east-west, dips 74° SE.
13. Marine terrace deposits tilted approximately 13° NE.
14. Marine terrace deposits with approximately 2 m of cumulative offset along a narrow fault zone (down to the east) that strikes approximately N. 50° W., dips 70° NE.
15. Thrust faulted marine terrace deposits with estimated 15–20 m of throw (up to the south) along eastern extension of Sylvan thrust; terrace deposits tilted approximately 28° NE.
16. Near-vertical fault splay of Chupines fault zone exposed in trench; stratigraphic relationships and soil profiles suggest Holocene displacement (Vaughan and others, 1991)
17. Pleistocene continental deposits ("Paso Robles Formation") cut by branch of Chupines fault exposed in trench; fault strikes east-west and dips vertically (Bowen, 1980)
18. Possible hydrogeologic barrier along trace of Hatton Canyon fault (Oliver, 1991)
19. Landslide deposits offset by near-vertical trace of Hatton Canyon fault
20. Fluvial terrace remnant strikes N. 62° W., dips 22° NE. along Hatton Canyon fault zone
21. Fluvial terrace deposits south of Navy fault tilted 15° NE.
22. Fluvial terrace deposits offset approximately 1 m along fault of Navy zone that strikes N. 22° W., dips 65° NE.
23. Series of resistant ridges in fluvial terrace deposits strike N. 20-30° W. suggest that terrace deposits have been sheared; deposits appear to be truncated on the southwest by fault of Berwick Canyon zone
24. Fluvial terrace deposit strikes N. 50° W., dips 18° NE. within Tularcitos fault zone
25. Fluvial terrace remnant faulted against steeply dipping Monterey Formation by en echelon fault of the Laureles zone that strikes N. 38° W.

SUBSURFACE STRUCTURE CONTOUR MAP, NORTH PART OF SEASIDE 7.5-MINUTE QUADRANGLE



(Modified from Rosenberg and Clark, 1994, plate 1. Original scale 1:24,000)

LIST OF WELL DATA FOR SUBSURFACE STRUCTURE CONTOUR MAP, NORTH PART OF SEASIDE 7.5-MINUTE QUADRANGLE

Well number	Well name	Year drilled	Surface elevation (ft)	Total depth (ft)	Elevation on top of Tm (ft)	Unit at bottom	Remarks
1.	Camp Huffman	1912	380	485	B-105	QTc	
2.	MPWMD FO-07	1994	460	925	B-465	Tsm	
3.	F.O. test hole B	1964	180	500	B-320	QTc	
4.	Monterey Sand deep	1990	81	920	-814	Tm	
5.	Monterey Sand Metz	1981	28	760	-681	Tm	83°F, sulfur
6.	Ord Village #1	1941	143	750	E-690	Tsm	82°F, sulfur
7.	Military	1963	145	268	B-123	QTc	
8.	Ord Village #2	1941	137	555	B-418	QTc	
9.	Paralta	1990	330	960	-490	Tm	warm
10.	Memorial Park	1983	325	440	B-115	QTc	
11.	Ord Grove test well	1967	260	500	E-310	Tsm	
12.	Seaside city test well #3	1973	308	700	-382	Tm	
13.	Seaside city test well #1	1964	233	455	E-330	Tsm	
14.	Luzern test well #5	1966	154	365	-211	Tm	
15.	J.S. Horn G.J. #1	1949	154	1237	-211	Kgr?	
16.	Playa test well #3	1967	52	605	-522	Tm	
17.	E. Monterey hot spring	1902	40	785	-735	Tm	120°F, artesian
18.	MPWMD Tioga MW-1	1992	33	250	B-217	QTc	
19.	Sand Bowl Metz 1	1948	40	2151	-536	Kgr	
20.	Tioga #8 test well	1967	35	515	-477	Tm	
21.	La Salle #1	1954	110	510	-204	Tm	
22.	Luxton	1959	88	289	-200	Tm	
23.	Cal. Water test #6	1957	96	252	-140	Tm	
24.	Darwin	1954	132	228	-95	QTc	
25.	Seaside city test well #2	1964	222	439	-65	Tm	
26.	Seaside city test well #5	1973	250	375	12	Tm	
27.	City Test #4	1964	210	450	6	Tm	
28.	Flores #5 test well	1967	118	170	-17	Tm	
29.	Cal. Water test #2	1957	102	225	3	Tm	
30.	Lowell #4 test well	1967	100	98	22	Tm	
31.	Cal. Water test #3	1957	165	195	35	Tm	
32.	MPWMD #1	1986	360	490	30	Tm	
33.	MGT	1963	247	523	B-276	Tsm	
34.	MPWMD #4 Deep	1988	175	640	-395	Tm	
35.	Del Rey Oaks test well	1990	178	580	-302	Tm	
36.	Plumas Test '90	1990	159	550	-316	Tm	
37.	PG&E Hamilton Ave.	1978	109	120	+6	Tm	
38.	Amador test well	1967	106	261	-62	Tm	
39.	PG&E Shafer St.	1978	93	120	-12	Tm	
40.	Harcourt	1963	18	192	B-174	QTc	
41.	Elm #6 test hole	1967	33	100	-51	Tm	
42.	Elm #1	1966	33	115	-51	Tm	
43.	K-Mart	1976	28	114	-41	Tm	
44.	Monte	1966	29	80	-41	Tm	
45.	Orange	1956	29	113	B-84	QTc	
46.	PG&E Contra Costa	1978	19	120	-93	Tm	
47.	Tom Phillips	1959	20	159	-41	Tm	
48.	Granite Construction	1966	63	83	B-20	Qoe	
49.	Granite Rock	1978	45	125	B-80	Qoe	
50.	MPWMD Tioga MW-2	1992	16	260	-224	Tm	
51.	Mont. Beach Hotel 1	1966	16	56	-37	Tm	
52.	Div. of Highways #D5	1960	10	55	-42	Tm	
53.	Donley EB-1	1975	12	66	-52	Tm	
54.	Geolabs B9	1974	9	32	-20	Tm	
55.	Donley EB-2	1975	11	71	-55	Tm	
56.	Monterey City WPCP	1965	20	88	-35	Tm	
57.	MRWPCA TP-1	1990	25	72	-23	Tm	H2S odor
58.	Seabee	1988	33	112	?	?	
59.	NPGS TP-1	1990	41	370	5	Tm	artesian
60.	NPGS MW-1	1990	28	530	3	Kgr	artesian
61.	Fairgrounds test hole #1	1977	75	310	104	Tm	
62.	Hutchings	1973	76	100	26	Tm	
63.	Polo Tract #1	1931	130	370	78	Tm	
64.	NPGS golf course #5	1966	115	82	85	Tm	
65.	NPGS golf course #2	1966	120	80	91	?	
66.	NPGS golf course #7	1973	103	100	69	?	
67.	NPGS golf course #8	1973	115	100	83	Tm	
68.	Del Monte golf course	1976	110	410	80	Tm	
69.	MPWMD 15S/1E-33Pa	?	212	?	150	?	
70.	Aguajito 1	1990	367	1447	217	Kgr	
71.	Jacks	?	275	430	132	Tm	
72.	Firestone	1957	230	440	104	Tm	
73.	Monterra M-11	1991	198	1455	133	Tus	
74.	Anastasia	1977	112	156	80	Tm	
75.	Tanner	1977	110	86	37	Tm	
76.	Cal. Water well #2	1959	105	80	48	Tm	
77.	Cal. Water well #1	1959	110	46	72	Tm	
78.	J.S. Horn T.A. #1	1949	90	1837	30	Kgr?	
79.	City of Mont. corp. yard	1988	275	163	140	Tm	
80.	MPUSD	1966	140	101	104	Tm	
81.	Monterra M-1	1980	130	360	65	Tm	
82.	Ryan Ranch #2	1978	244	460	-186	Tm	
83.	Ryan Ranch #5	1981	276	445	B-154	Tsm	
84.	Ryan Ranch #7	1981	296	500	-189	Tm	
85.	Ryan Ranch #8	1981	306	480	-174	Tsm	
86.	Ryan Ranch #3	?	220	370	-95	Tm	
87.	Ryan Ranch #6	?	214	250	89	Tm	
88.	Bear Canyon #1	1983	240	375	184	Tm	
89.	Laguna Seca Ranch	1956	220	180	B+40	QTc	
90.	Monterey Co. MW-1	1988	505	720	-135	Tm	
91.	Laguna Seca Ranch '56	1956	250	254	B-4	QTc	
92.	Subdivision	1962	285	404	-18	Tm	
93.	Lit Ng	1977	330	739	260	Tm	artesian
94.	Shaffi	?	760	725	685	Tm	
95.	LSR test '56	1956	320	112	208	QTc	
96.	Race track	1959	354	723	-16	Tm	
97.	Golf course	1981	340	550	-55	Tm	
98.	LSR pond test	1959	320	520	94	Tm	
99.	LSR main gate #1	1956	345	705	-108	Tm	
100.	LSR paddock #1	1972	325	559	-165	Tm	
101.	Pratt	1979	340	395	-10	Tm	
102.	Paddock #4	?	380	300	B+80	QTc	
103.	Lazy Jake	?	380	230	B+150	QTc	
104.	Saunders	1979	550	926	-126	Tm	
105.	Roerdan	1979	590	503	B+87	QTc	
106.	Hidden Hills Mutual	1974	550	970	E-450	Tsm	
107.	Hidden Hills Standex	1977	575	850	E-325	Tsm	
108.	Xum Speegle	1957	430	603	B-173	QTc	
109.	Toro Water #3	1966	453	770	E-520	Tsm	
110.	Monterey Co. MW-2	1988	430	1000	E-750	Tsm	
111.	MPWMD #6	1991	470	1200	E-802	Tsm	
112.	SPCA	1963	398	708	B-310	QTc	
113.	Laguna Seca Park #1	1975	391	873	E-532	Tsm	
114.	Stolich #2	1988	400	600	B-200	QTc	
115.	Windmill	?	386	?	?	QTc	
116.	LSR test '88	1988	400	610	B-210	QTc	
117.	Paddock (aband.)	1965	382	698	-298	Tm	
118.	MPWMD #2	1986	700	515	440	Tm	
119.	Monterey Co. TH-2	1988	650	320	360	Tm	
120.	Monterey Co. TH-1	1988	480	560	-10	Tm	
121.	Monterey Pen. Oil #1	1923	615	2352	E-150	Kgr?	
122.	MPWMD #3	1986	775	715	125	Tm	

Notes:
Geologic units: Qoe (Older eolian deposits "Aromas Sand"), QTc (Continental deposits "Paso Robles Formation"), Tsm (Santa Margarita Sandstone), Tm (Monterey Formation), Tus (unnamed sandstone "Tularcitos sandstone"), and Kgr (granitic rock).

Elevation datum is mean sea level: B = below given elevation, E = estimated. Values listed in English units as per original data.

Data compiled from the following: California Department of Conservation, Division of Oil and Gas well log files; Logan, 1982, 1985, unpublished; Monterey County Water Resources Agency well log files; Monterey Peninsula Water Management District well log files; Staal, Gardner & Dunne 1988a, 1988b, 1990a, 1990b, 1990c, 1991, 1992a, 1992b; and Thorup, R.R., unpublished.

GEOLOGIC MAP OF THE MONTEREY AND SEASIDE 7.5-MINUTE QUADRANGLES, MONTEREY COUNTY, CALIFORNIA: A DIGITAL DATABASE

By

Joseph C. Clark, William R. Dupré, and Lewis I. Rosenberg

1997

U.S. Department of the Interior
United States Geological Survey

Plot derived from
Open-File Report 97-30

Base scanned from U.S. Geological Survey Monterey and Seaside topographic maps, 1968 editions.

Universal Transverse Mercator projection

Sheet 2 is a plot derived from data contained in the digital database Open-File Report 97-30, "Geologic map of the Monterey and Seaside 7.5-minute quadrangles, Monterey County, California: A digital database." A PostScript file of sheet 2 is included in the Open-File Report, but the Open-File Report does not contain a paper copy of sheet 1 or 2. The Open-File Report consists of the digital data and a pamphlet explaining the database and indicating how to obtain the data from which sheets 1 and 2 were prepared. The pamphlet also explains how those without computers can obtain a plot of the map and explanation from a private vendor.